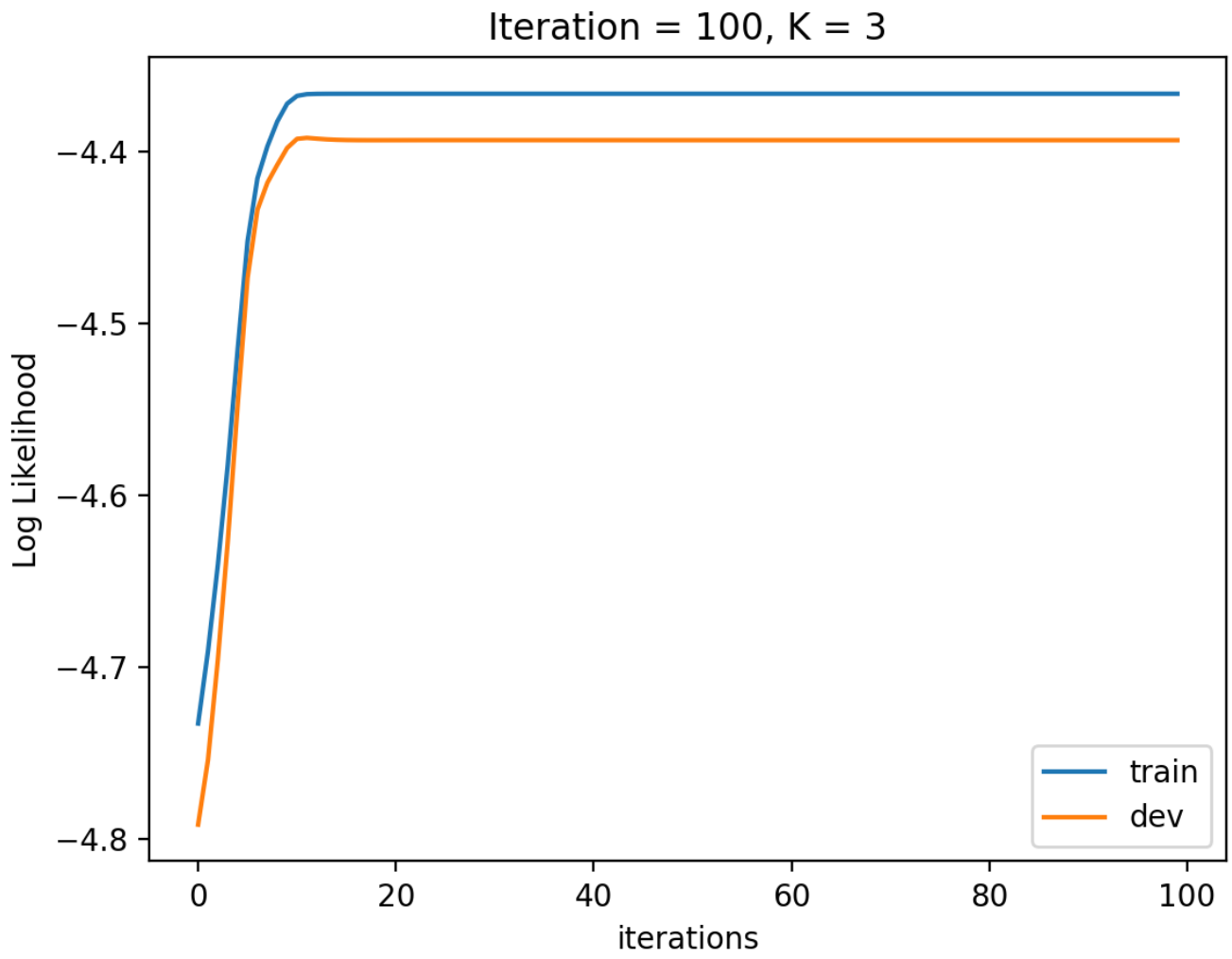
CSC 446, HW#8, Kefu Zhu

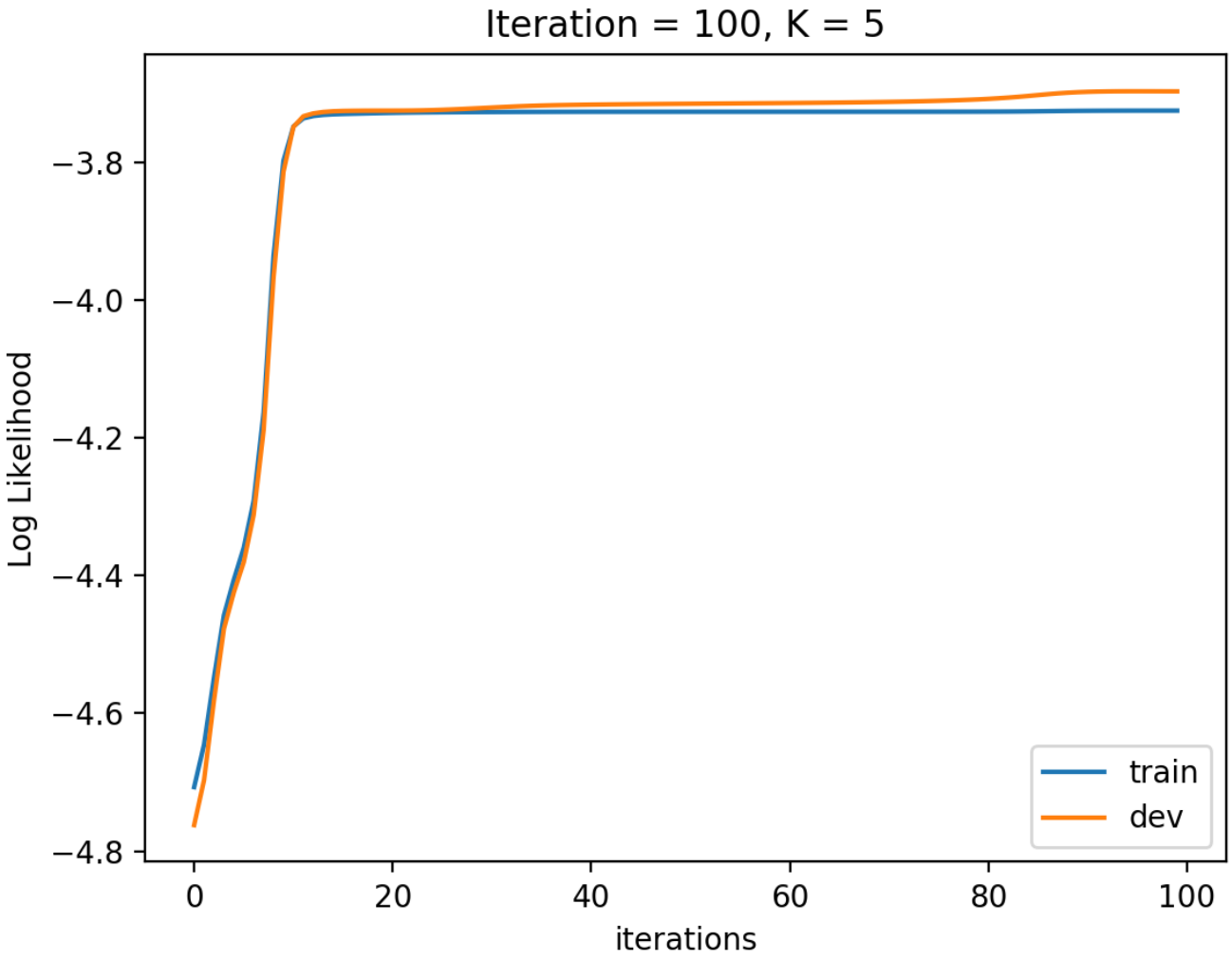
Note: In order to compare with previous homework. I used the same value of `--iterations 100` and `--cluster_num 3,5,10` for experiment.

Tuning of `--cluster_num`

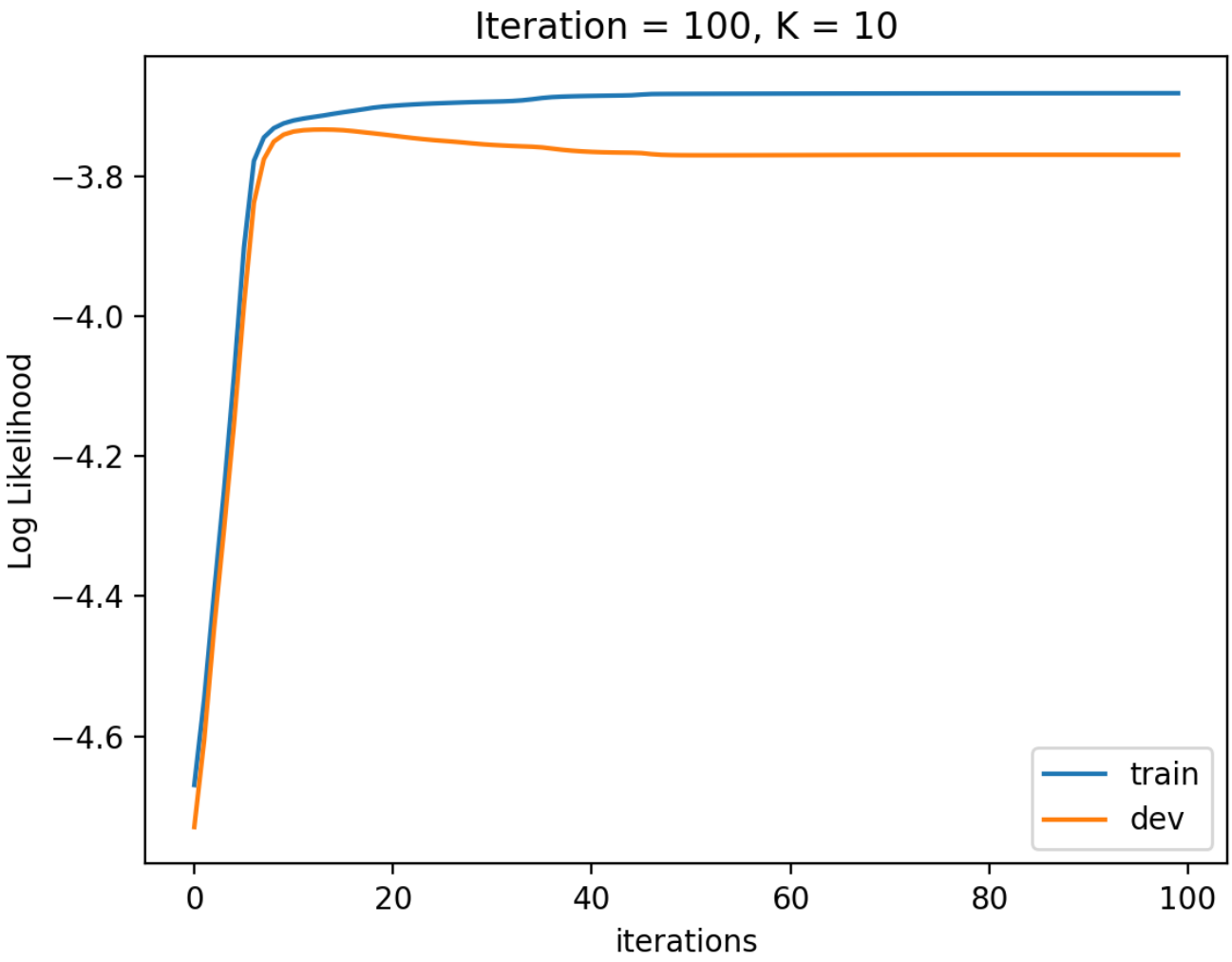
K = 3



K = 5


Iteration = 100, K = 5
Log Likelihood
−3.8
−4.0
−4.2
−4.4
−4.6
−4.8
0
20
40
60
80
100
iterations
train
dev

K = 10



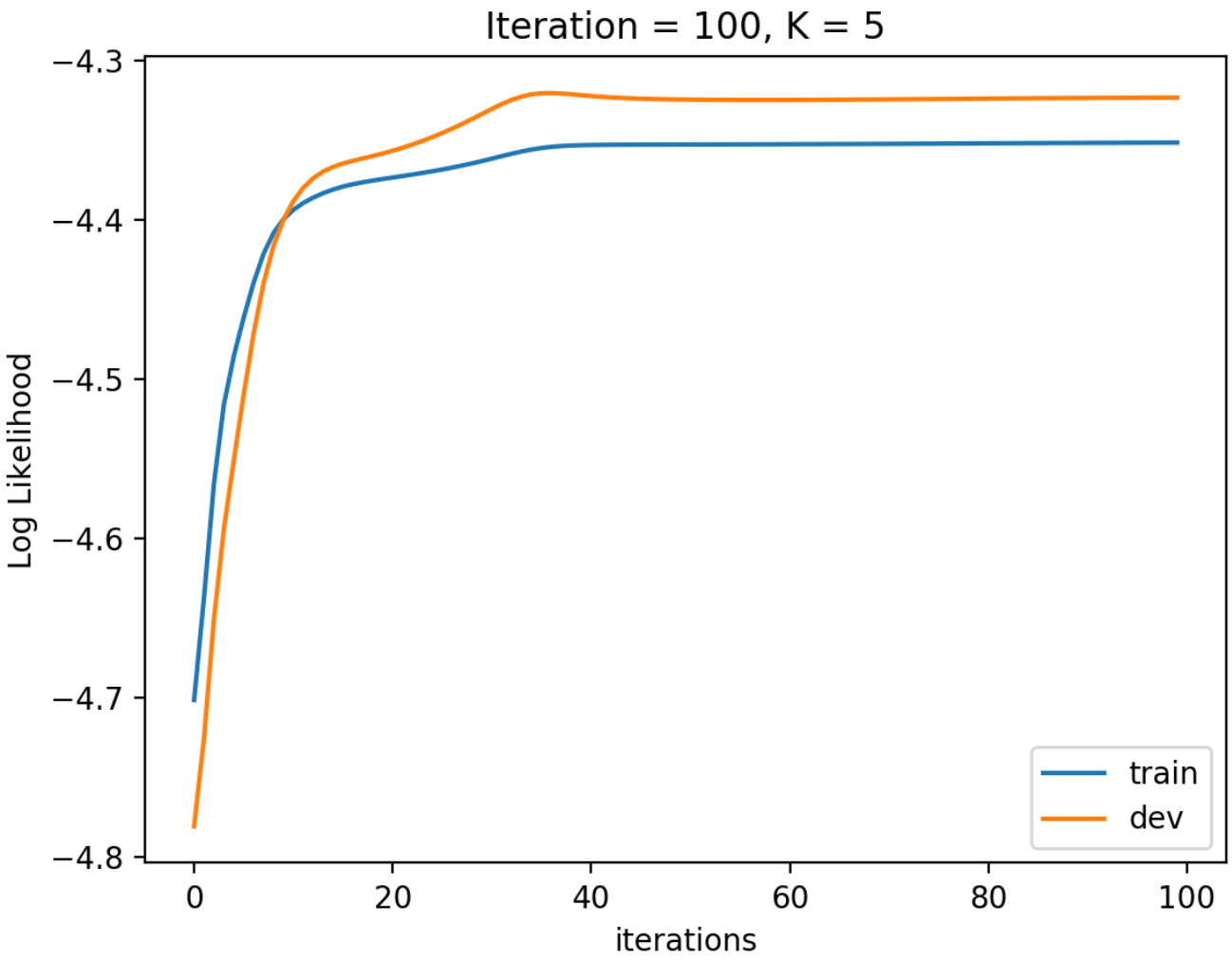
Note:

From the 3 experiments above, similar to the experiment in previous homework for GMM, we can clearly see when $K = 5$, the model has the best performance.

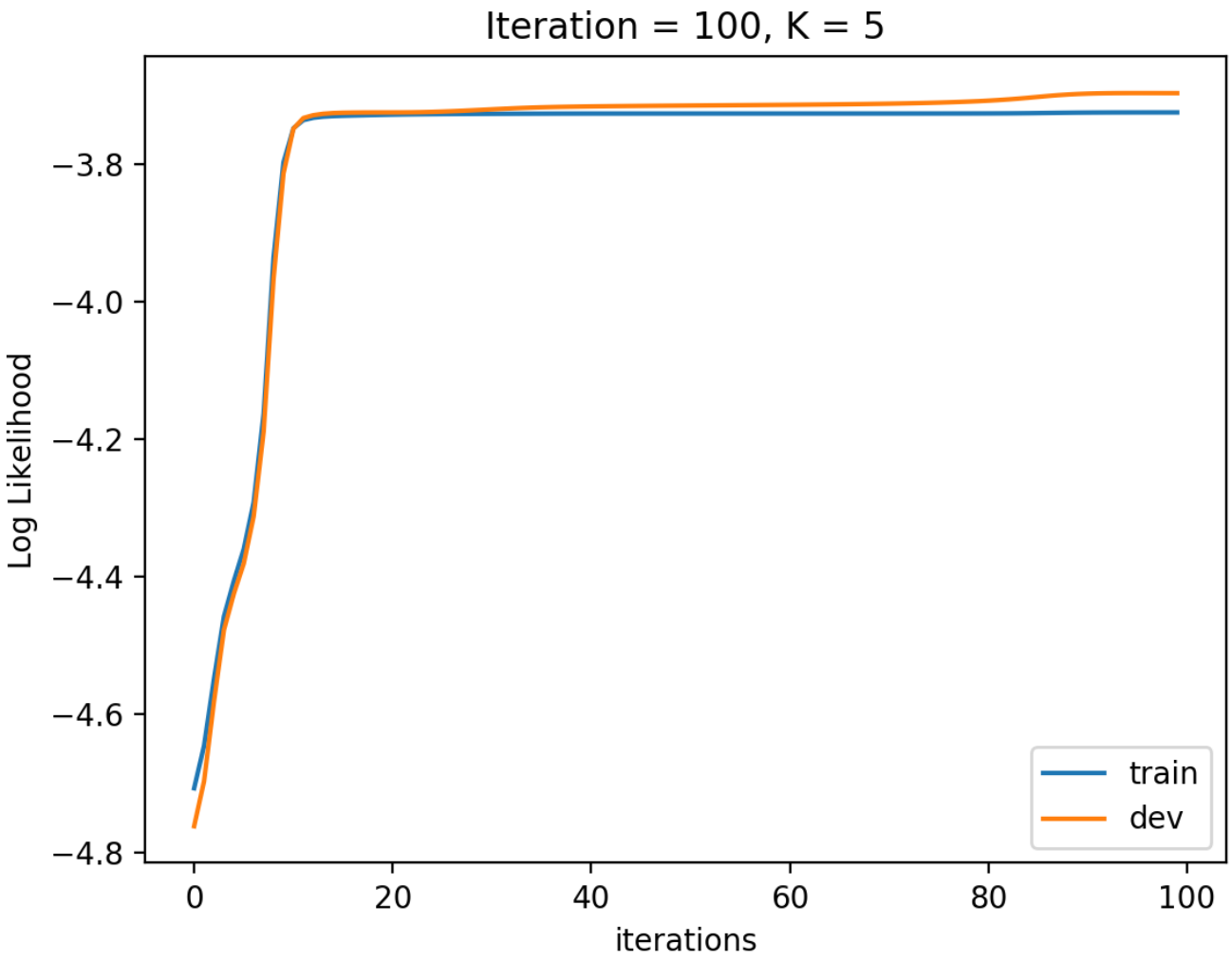
- Although model with `K = 3` is not overfitting, it does not achieve better performance compared to model with `K = 5`
- model with `K = 5` has highest log likelihood among the three
- model with `K = 10` is clearly overfitting on the training dataset, resulting in the decline of log likelihood in the `dev` dataset

Does the HMM model the data better than the original non-sequence model?

GMM model with K = 5



HMM model with K = 5



By comparing the log likelihood, we can conclude that HMM model is better than the GMM model (non-sequence model)

What is the best number of states?

Among the experiments above, the best number of states is 5